STRUMENTI SCIENTIFICI

CINEL® S.r.l.

Nitrogen generator model ZEFIRO 3-5

User's manual

Version 2.00

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Index

INDEX 1

INTRODUCTION 2

SCOPE OF THE MANUAL 2
SPECIFICATIONS 2
NOTES ON FCC COMPLIANCE 2
CORRECT USE 3
HEALTH AND SAFETY 3
WARNING: NITROGEN AND OXYGEN 3
WARNING: ELECTRICITY 4
WARNING: SAFETY PRECAUTIONS 4
PACKING LIST 5

DESCRIPTION 5

INSTALLATION 6

RECEIVING THE GENERATOR 6
PLACING THE GENERATOR 6
SYMBOLS USED ON THE GENERATOR 6
GAS CONNECTIONS 6

INITIAL START-UP 7

START ZEFIRO 7
OPERATION 7

MENU STRUCTURE 8

PARAMETERS 8
DIAGNOSTIC 8
ALARM HISTORY 8
SET CLOCK 8
SPECIAL FUNCTION 9

PRE-ALARMS AND ALARMS 9

PRE-ALARMS 9
ALARMS 9

MAINTENANCE 10

ROUTINE MAINTENANCE 10
CLEANING 10
SERVICE KITS 10
4000 hours service kit *11*
1. Exchange the filter element *11*
2. Exchange the silencer *13*

RETURNING THE UNIT 14

SPARE PARTS LIST 15

APPENDIX A 16

REMOVAL OF THE COMPRESSORS 17

Introduction

Scope of the manual

This manual provides operation and maintenance instructions for model ZEFIRO 3 & 5 nitrogen generator.

Specifications

Specifications of the nitrogen generators:

Model	ZEFIRO 3	ZEFIRO 5
Standard nitrogen flow rate STP: Standard temp. and pressure (20°C, 1 bar)	3000 cc/min at STP	5000 cc/min at STP
Max outlet pressure	5 bar (75 psi)	
Standard purity	99.999% (O_2 < 10 ppm) at STP	
Weight	95 kg	110 kg
Power consumption	800 W	1400 W
Input voltage	110 or 230V / 50 or 60Hz	
Fuse	N.2 5x20 mm, 10 A, type F (230 V)	N.1 6.3x32 mm, 20 A,type F (110 V)
Pressure accuracy	0.1 bar (± 0.5 %)	
Microprocessor controlled display	Graphic display, 128 x 64 pixels	
Index of protection	IP2x	
Operating conditions: - Temperature - Relative humidity	15°C to +35°C 0-80%, non condensing	
Over voltage category	II	
Pollution degree	2	
Sound pressure level	< 73 dB(A)	
Alarm relays	250 VAC, 12 A max	
Output port	Swagelok for tube 1/8" or 3 mm	
Case dimensions	482 x 835 x 641 mm (WxDxH)	

Notes on FCC compliance

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio

communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

WARNING!
Any changes or modifications to this equipment not expressly approved by the manufacturer may void the user's authority to operate the equipment.

Correct use

Nitrogen generator is designed to produce nitrogen for laboratory use. The unit must only be operated for this purpose, according to the specifications and instructions provided in this manual. In particular, the following warnings must be observed at all times:

- Indoor use only
- Never operate the unit in below-zero temperatures.
- Only operate the unit in a room with sufficient ventilation (see "Placing the unit").
- Always unplug the unit from the mains power supply before accessing the internal components for replacement.
- Only the parts described in the "Spare parts list" can be replaced by the user.

Health and safety

Correct use of the ZEFIRO nitrogen generator is important for your personal safety and for trouble-free functioning of the ZEFIRO. Incorrect use can cause damage to the ZEFIRO or can lead to incorrect gas supply.

Warning!

- Read this manual before you start the installation and putting into operation of the ZEFIRO. Prevent accidents and damage to the ZEFIRO.
- Contact your supplier if you detect a problem that you cannot solve with this manual.
- Only service-engineers, that are qualified to work on electric and pneumatic equipment, are allowed to do the installation, maintenance and repairs. Unqualified people are not allowed to repair the equipment. Lift the ZEFIRO with a forklift. Follow the legislation and instructions for operating the forklift.
- Do not tamper or experiment with the equipment. Do not exceed the technical specifications for the ZEFIRO.

Warning: nitrogen and oxygen

The ZEFIRO generates nitrogen as a product. Oxygen enriched air is released as waste.

- Nitrogen can cause suffocation!

- Oxygen-enriched air leads to increased risk of fire in the event of contact with inflammable products. Make sure that there is adequate ventilation at all times!
- The ZEFIRO is not designed for installation in an Exx-classified area.
- Do not install the ZEFIRO in an area where explosive mixtures may occur.

Warning: electricity

- Only service-engineers, that are qualified to work on electric equipment, are allowed to do the installation, maintenance and reparations.
- Disconnect the main power supply before you do the maintenance or repair.
- If a service-engineer has to work on the ZEFIRO while the electric power it is connected, the service-engineer must be very careful with respect to the electric hazards.

Warning: safety precautions

- Make sure that the ventilation rate is sufficient in the room where the enriched oxygen is ventilated, or lead the enriched air outside.
- Keep the ambient temperature between 10 and 35 °C.
- Install the peripheral equipment, piping and nitrogen storage vessels according to standard procedures.
- Do regular maintenance to the ZEFIRO.

Packing list

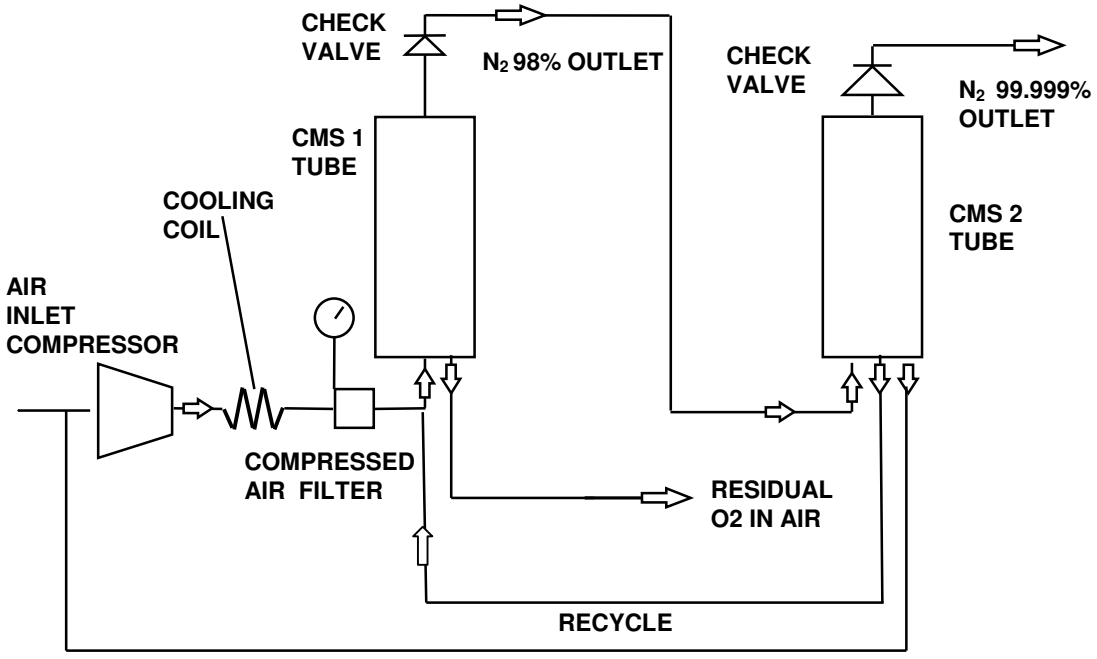
List of items included in the shipment

Quantity	Description
1	Nitrogen generator
1	Instruction manual
1	Metric combination wrench n. 8
1	Cable for contact relays
1	Power cable

Description

The nitrogen generator produces pure nitrogen through the filtration of compressed air. The key element of the generator is a carbon molecular sieve that is able to separate the nitrogen molecules from the oxygen ones present in the compressed air stream. The carbon molecular sieve tubes are self regenerating cyclic. The compressor (two compressors on ZEFIRO 5) is integral in the generator and theirs purpose is to compress air up to 5 bar and force it into the tubes containing the carbon molecular sieve. The compressor allows a double stage compression system that ensures a long life of the same compressor and of all the internal components.

The generated nitrogen gas is accumulated in a specific reservoir. The internal pressure is controlled by a pressure transducer. The outlet pressure is controlled by a proportional valve. The nitrogen then passes through outlet port at the rear.



Installation

Receiving the generator

All units have been carefully inspected before transport. Visual checks for damage and functional tests should be performed upon receipt. Any damage must be immediately noted and reported. The generator must only be returned according to the shipping instructions provided.

Placing the generator

The nitrogen generator must be placed on a flat, level, vibration-free, shock-free surface. Do not place the generator over a source of heat, as this may cause the device to overheat. The unit should not be in contact with any other objects on any side, and the air inlet must not be blocked. **Leave at least 30 cm of free space at rear for ventilation.** Do not operate the generator in a sealed or unventilated room. Do not operate the generator at below freezing temperatures. Operation is guaranteed at operating temperatures between +15 and +35°C.

WARNING!
Normal precautions for any nitrogen supply should be taken when using the generator. DO NOT use in sealed or unventilated rooms. Nitrogen can cause suffocation.

Symbols used on the generator

Earth symbol:
This symbol marks the earth connections to the chassis of the nitrogen generator.

Gas connections

Pure nitrogen at regulated pressure is available at the nitrogen outlet port at the rear of the generator. This port must be connected to 1/8" tubing using a stainless-steel or copper Swagelok connector. Teflon connectors are not suitable. The pressure at this port is shown on the display.

WARNING!
The line from the relief port should never connected in such a way that back pressure can develop.

Initial start-up

Start ZEFIRO 3-5

- Switch on the unit.
- Press start.
- It will at least 60 minutes before the nitrogen produced will reach the stated purity.
- The system is ready for use now.

Operation

The operating status of the unit is shown on the main screen on the graphic display.
The main screen has three options at the bottom, corresponding to the three buttons on the unit, which are used to run the various functions and access the configuration and diagnostics of the unit.

In the main screen, the three buttons have the following function:

Left button: start/stop;
Central button: reset the alarms;
Right button: enter menu;

In the menu, the three buttons change their function:

Left button: scroll;
Central button: select;
Right button: exit the selected menu voice;

Menu structure

Parameters

Item	Description	Options / Range	Default
Pressure units	*Sets the desired unit of measure for the pressure*	bar / kPa/ psi	bar
Temperature units	*Sets the desired unit of measure for the temperature*	°C/°F	°C
Flow units	*Sets the desired unit of measure for the flow rate*	l/min-scf/min	l/min
Auto start	*Sets whether the unit automatically starts production when power is switched on.*	YES / NO	NO
Display contrast	*Sets the desired contrast of the display*	1-10	5
Beeper	*Sets the alarm beep on/off*	YES/NO	YES
Pre-alarms in list	*Sets the possibility to see the pre-alarms in the alarm history list*	YES/NO	NO

Diagnostic

Item	Description
C1 temp	*Shows the instant temperature in the section 1 of the cabinet*
C2 temp	*Shows the instant temperature in the section 2 of the cabinet*
S#2 press	*Shows the instant pressure in the output reservoir*
nf	*Shows the instant pressure not filtered*
Out press	*Shows the instant output pressure*
Flow	*Shows the output flow (note: the flow is calculated and not measured)*
Oxygen	*Shows the instant oxygen content (only if the optional O_2 analyzer is installed)*
WT CMP	*Shows the work time of the compressor*
SRV 4000	*Shows the work time for the 4000 h service*

Alarm history

Shows the history of the alarms of the unit.

Set clock

Allow the regulation of the clock of the unit. The central button of the display increases the values and the left button passes to the next number.

Special function

Allow the activation of some special function (i.e. the reset of the working time counter of the filter) with the digitations of a code. The central button of the display increases the values and the left button passes to the next number.
MENU-SPECIAL FUNCTIONS-CODE-SCROLL

Codes:

- **Reset of the 4000 h work time counter: 26103**

Pre-alarms and alarms

There are a series of pre-alarms and alarms on the unit. When a pre-alarm starts, a sound advertise about a problem and the type of problem is displayed on the main screen. When an alarm starts, the unit also stops.
On the main board is installed a contact relays to control the pre-alarms and alarms from a computer. The signal is intermittent when a pre-alarm starts and it is fixed when an alarm starts. In the rear side of the unit there is the connector for the relays.

What do they mean and how to proceed:

Pre-alarms

- *Max pre-alarm cabinet temperature*: the temperature inside the cabinet is over the maximum limit. Check if the room temperature respects the specifications and if there is enough space in the rear side of the unit for the ventilation. Otherwise, remove the right panel of the machine and the cabinet panel and check if all the fans are working. If it is all right, call the service. Press the reset button.
- *Min pre-alarm press. section 2*: the pressure in the output reservoir is less than the lower limit. Call the service. Press the reset button.
- *Min pre-alarm press. outlet*: the outlet pressure is less than 3 bar.
- *Max pre-alarm oxygen (only if the optional oxygen analyzer is installed)*: the N_2 purity is decreasing. Call the service. Press the reset button.
- *Work time pre-alarm compressor:* the compressor (compressors on ZEFIRO 5) must be changed. Call the service. Press the reset button.
- *Pre-alarm service 4000 h:* the filter and the silencer must be changed. See the maintenance section of this manual relatively to the *4000 h service kit*. Call the service to order the new kit. Press the reset button..
- *Pre-alarm clock failure:* the clock is broken. Call the service. Press the reset button.

Alarms

- *Max alarm cabinet temperature*: the temperature inside the cabinet is too high.
- *Min alarm press. section 2*: the pressure in the output reservoir is too low.
- *Max alarm press. section 2*: the pressure in the output reservoir is too high. Check if the output fitting is free. If it is all right, call the service.
- *Min alarm press. outlet*: this alarm starts if the outlet pressure is still less than 3 bar after 36 hours from the machine start.

- *Max alarm press. outlet*: the outlet pressure is too high. Check if the output fitting is free. If it is all right, call the service.
- *Max alarm oxygen (only if the optional oxygen analyzer is installed)*: the N_2 purity is over the maximum limit.
- *Work time alarm compressor:* the compressor (compressors on ZEFIRO 5) must be changed.*Alarm service 4000 h: :* the filter and the silencer must be changed. See the maintenance section of this manual.
- *Alarm EEP failure:* failure of the static memory. Call the service.

Maintenance

With proper care and maintenance, your nitrogen generator should provide you with years of trouble-free operation. There are no adjustments to be made to the generator. The only routine service operations are those described below.

Nonetheless, the generator should be inspected approximately every 2 years. Contact your supplier.

Routine maintenance

The following section describes the maintenance operations required for the correct operation of the nitrogen generator.

Cleaning

The internal components of the nitrogen generator do not need to be cleaned and should not be accessed by the user for cleaning. To clean the outside of the unit, only use a damp cloth (no detergents, acids or aggressive or abrasive substances).

Service kits

- Every 4000 hours the user must replace the filter and the silencer of the unit.

WARNING!

Only qualified personnel should perform service on this product. Any damage done to this product as a result of improper maintenance procedure will void the warranty.

4000 hours service kit

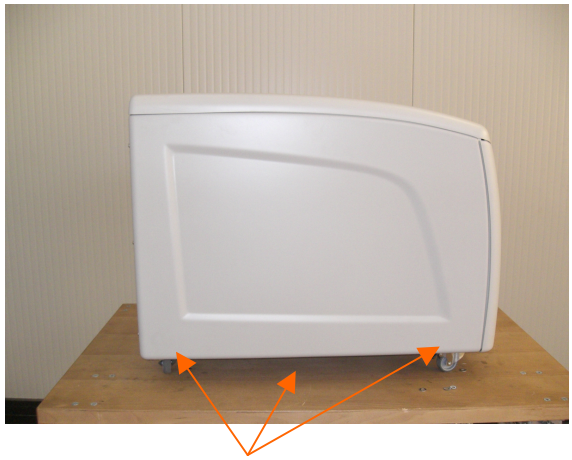
Every 4000 hours the user must replace the filter of the unit.
A specific maintenance kit is available as spare part. This kit includes all required parts.
Specifically, each kit includes:

1. **New filter element**
2. **New silencer**

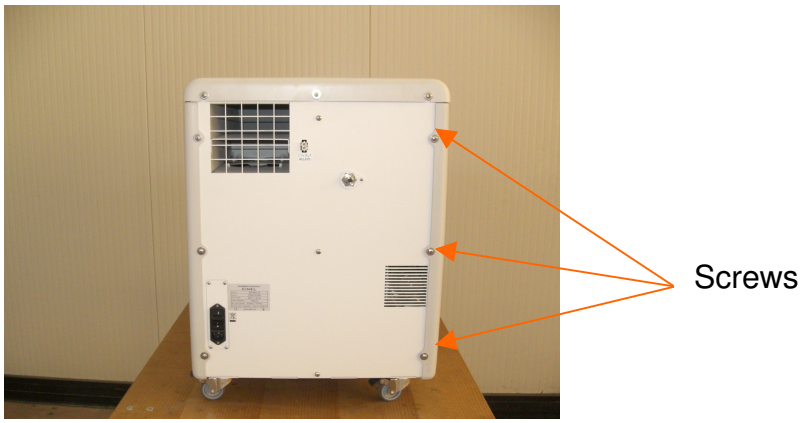
1. Exchange the filter element

- switch off the instrument and disconnect it from the power line;
- unscrew partially the two bottom screws of the front panel with the wrench;

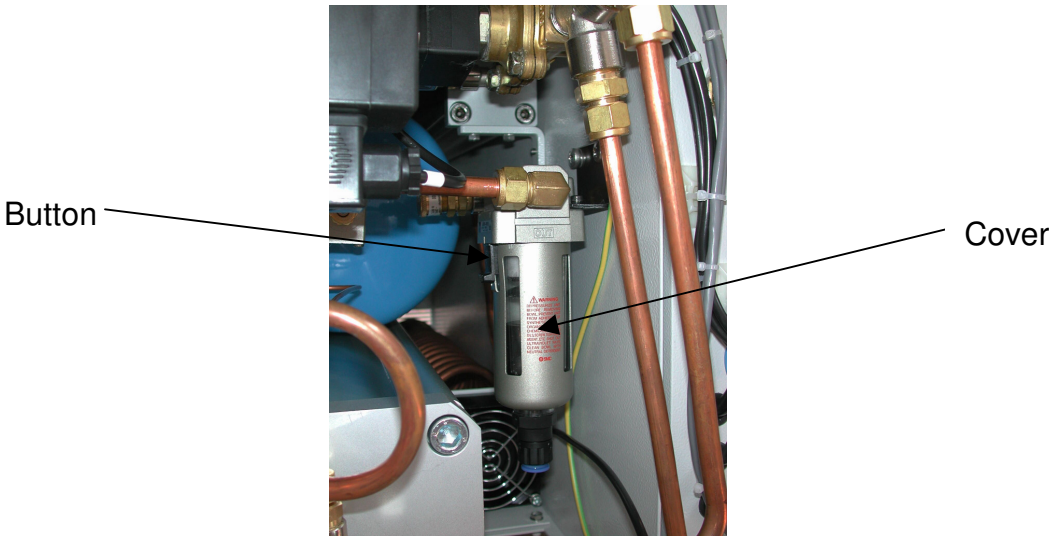
- remove the front panel;
- unscrew partially the three bottom screws of the side panel with the wrench;



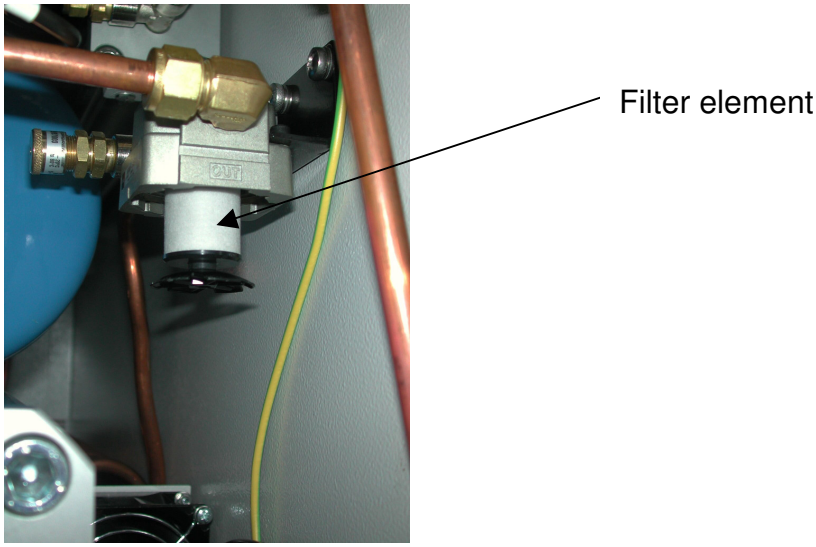
- unscrew the three rear screws of the side panel;



- click the button, rotate the cover of 1/8 turn in a left-hand direction and then push it in the bottom direction;



- unscrew the filter element and replace it with the new one;



2. Exchange the silencer

- unscrew the silencer and replace it. Be careful and avoid to screw strongly the silencer;

- reassemble;
- reconnect the power line and switch on the unit. Enter the menu, go to the special functions and insert the number:

26103

This procedure reset the 4000 h work time counter.

NOTE

If the cover of the filter is difficult to remove, probably there is still pressure inside it. To solve the problem, unscrew partially the bottom cap of the cover until the internal pressure reach the ambient pressure.

Returning the unit

In the event of any faults or damage, first notify the agent or distributor who supplied the unit. Please also provide full details of the problem, including the model and serial number. Instructions will then be provided for the service or the return of the unit. If the warranty has expired, or the fault is due to misuse of the unit, all repair and shipping costs are to be paid by the customer. All other costs are borne by the customer, except as otherwise expressly agreed upon.

WARNING!

If the unit has to be transported, make sure to use suitable packaging.

The unit should be transported in an upright position; this warning should be reported on the outside of the packaging.

Spare parts list

The table below provides a list and description of the spare parts of the nitrogen generator.

List of spare parts – ZEFIRO 3-5

p/n	DESCRIPTION
Z01-4000	4.000 hours maintenance kit
Z04-302	Air compressor 230V – 50/60 Hz

Remember that on ZEFIRO 5 there are N.2 compressors!

IMPORTANT!

The manufacturer reserves the right to change or modify its products without prior notice.

APPENDIX A

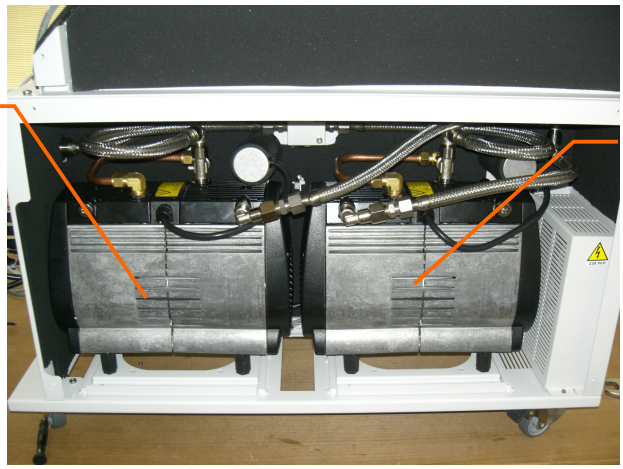
Removal of the compressors

First switch off the instrument and disconnect it from the power line

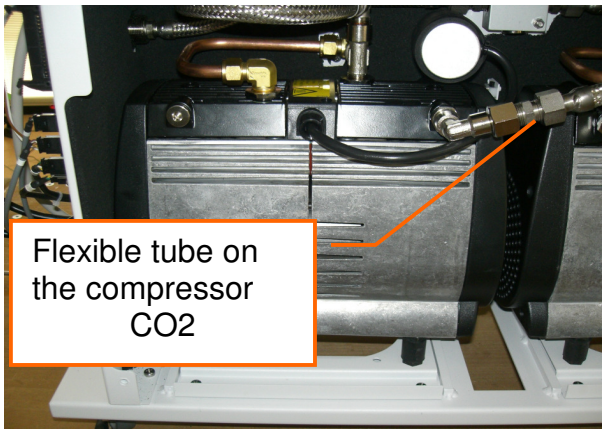
The compressor n.2 is mounted only on ZEFIRO 5.

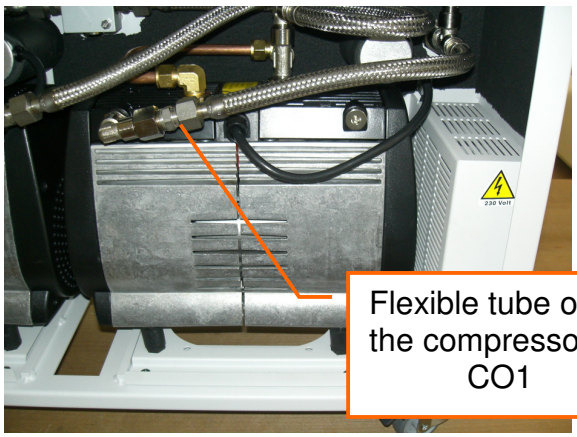
- Remove the right plastic panel and the removable sheet unscrewing the four screws;

- Now is possible to see the two compressors;

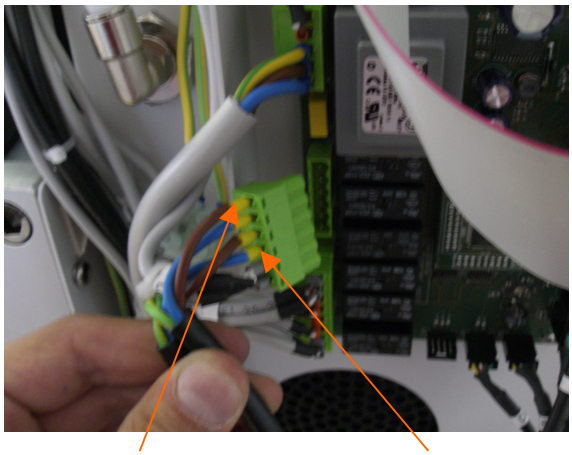


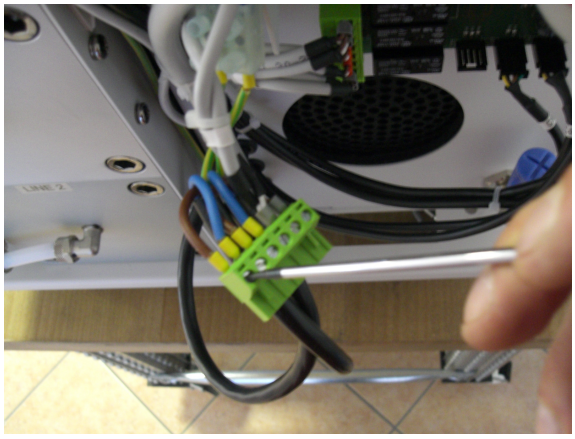
- Disconnect the two flexible tubes using spanners n. 17 and 22;





- Disconnect the alimentation cables of the two compressors using screwdriver;





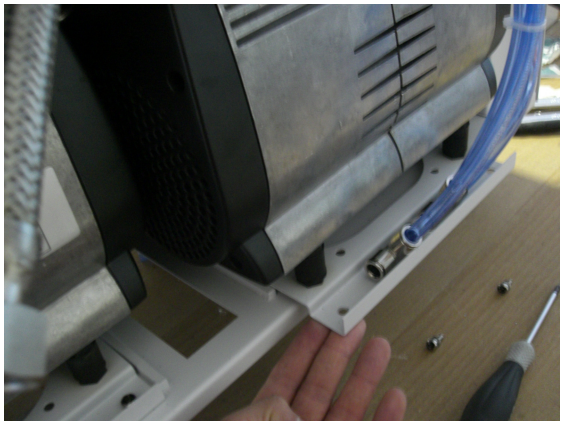
Compressor CO2

Compressor CO1

- Disconnect the ground cables of the two compressors using screwdriver;

Ground cables

- Unscrew the four screws of the two compressor's supports and remove them;



- For first remove the compressor CO2 and then the compressor CO1;
- Remount the compressors in the opposite order.